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● PRINTER RUSH ●
(PTO ASSISTANCE)

Application : 10/684037 **Examiner :** Glenn **GAU :** 2817

From: OF **Location:** [✓ IDC] FMF FDC **Date:** 10-7-05

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[RUSH] **MESSAGE:** Please verify information on page 12, line 16 of the text - overprints.

Thank you

[XRUSH] **RESPONSE:** Done

INITIALS:

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REV 10/04

[0039] As described in above, the total periphery length of the ring coupler hybrid circuit is $\frac{6}{4}\lambda_g$. Suppose conventional microstrips are utilized, and a wavelength of a waveguide at a design frequency is λ_{g1}. The ring coupler hybrid circuit is designed using a conventional microstrip into a round shape as in the prior art, wherein the round shape has a radius of:

$$2\pi R_1=\frac{6}{4}\lambda_{g1},\ R_1=\frac{3\lambda_{g1}}{4\pi} \text{ -- equation (1)}$$

And hence the round shape has an area of:

$$A_1=\pi R_1^2=\pi\frac{9\lambda_{g1}^2}{16\pi^2}=\frac{9}{16\pi}\lambda_{g1}^2 \text{ -- equation (2)}$$

In addition, a three-dimensional CCS L-C array designed using the ring coupler circuit has an area of:

$$A_2=\frac{6}{4}\lambda_{g2}P \text{ -- equation (3)}$$

wherein, λ_{g2} is the equivalent wavelength of a transmission line formed by the aforesaid L-C array, and P is the period or the single-side width of the unit cell shown in FIG. 1.

[0040] An area reduction factor (ARF) is defined as A_2/A_1. Thus:

$$\text{ARF}=\frac{\frac{6\lambda_{g2}P}{4}}{\frac{9\lambda_{g1}^2}{16\pi}}=\frac{8\pi}{3}\frac{\frac{\lambda_0 P}{SWF_{CCS}}}{\frac{\lambda_0^2}{SWF_{MS}^2}}=\frac{8\pi}{3}\frac{P}{\lambda_0}\frac{SWF_{MS}^2}{SWF_{CCS}} \text{ ---------------- equation (4)}$$

$\overline{\lambda}$

16π

$SWF^2\lambda$

$M50$

And, $\lambda_{g1}=\frac{\lambda_0}{SWF_{MS}}$, $\lambda_{g2}=\frac{\lambda_0}{SWF_{CCS}}$, wherein the SWF of the microstrip and the CCS transmission line are SWF_{MS} and SWF_{CCS}, respectively.

[0041] A conventional 5.4GHz ring coupler hybrid circuit and a 5.4GHz CCS ring coupler hybrid circuit are fabricated by RO4003™ microwave printed circuit board (PCB) substrates at the same time. Each substrate has thickness of 203.2μm, copper clad thickness of 17.5μm, and ε_r of 3.38. The SWF_{MS} of the conventional 70Ω ($50\sqrt{2}$) microstrip transmission line is 1.6468.